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SONY CDX-S11 CAR CD/RADIO EVALUATION AND REDESIGN

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1 CHAPTER: SONY CDX

1.1 INTRODUCTION

This report will evaluate the 'Sony CDX-S11' a car CD player and radio. The evaluation will use two main evaluation modalities, 1)Analytical and 2) Empirical.

The Analytical evaluation process will be compiled using Heuristic Evaluation techniques. It is the most appropriate modality as the method of operation is not fully predictable and there will be a panel of three experts conducting the evaluation. A simulation of how a user interacts with the device using a Cognitive Walkthrough will be performed.

The Empirical evaluation will incorporate 'Formative Evaluation' techniques and the development of a 'Medium Fidelity Prototype'. The prototype will represent some of the functionalities of the device. It will be used to test user performance of certain activities.

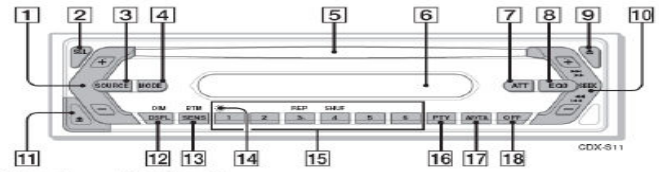
1.2 THE 'SONY CDX-S11'

This CD player has a quite a modern look and exceptional audio quality, however, the user interface requires drastic improvement.

The following are the technical details taken directly from the user menu.

- Product Description: Sony CDX S11 - radio / CD player
- Product Type: Radio / CD player - Xplod
- Dimensions (WxDxH): 17.8 cm x 17.8 cm x 5 cm
- Weight: 1.2 kg
- Form Factor: Full-DIN - in-dash unit
- Sound Output Mode: Stereo
- Equaliser: 3-band
- Equaliser Factory Presets: Club, NewAge, XPLOD, Custom, Rock, Jazz, Vocal
- Max Output Power / Channel Qty: 45 Watts x 4
- Radio: Radio tuner - AM/FM - 30 preset stations
- CD System: CD player - in-dash - 10 - 20000 Hz

Main unit



Refer to the pages listed for details.

1 **Volume +/– button**
To adjust volume.

2 **SEL (select) button** 4, 8
To select items.

3 **SOURCE button**
To power on; change the source (Radio/CD).

4 **MODE button** 6
To select the radio band (FM/MW/LW).

5 **Disc slot**
Insert the disc (label side up), playback starts.

6 **Display window**

7 **ATT (attenuate) button**
To attenuate the sound. To cancel, press again.

8 **EQ3 (equalizer) button** 8
To select an equalizer curve (XPLOD, VOCAL, CLUB, JAZZ, NEW AGE, ROCK and CUSTOM).

9 **⏏ (eject) button**
To eject the disc.

10 **SEEK +/– button**
CD:
To skip tracks (press); fast-forward/reverse a track (press and hold).
Radio:
To tune in stations automatically (press); find a station manually (press and hold).

11 **⏏ (front panel release) button** 4

12 **DSPL (display)/DIM (dimmer) button** 4, 6
To change display items (press); change the display brightness (press and hold).

13 **SENS/BTM button** 6
To improve weak reception: LOCAL/MONO (press); start the BTM function (press and hold).

14 **RESET button** (located behind the front panel) 4

15 **Number buttons**
CD:
5: REP
To play the current track/disc repeatedly.
4: SHUF
To play the tracks in random order.
Radio:
To receive stored stations (press); store stations (press and hold).

16 **PTY (Programme Type) button** 7
To select PTY in RDS.

17 **AF (Alternative Frequencies)/TA (Traffic Announcement) button** 7
To set AF and TA/TP in RDS.

18 **OFF button**
To power off; stop the source.

2 CHAPTER: RESEARCH

2.1 BACKGROUND

3 CHAPTER: ANALYTICAL HEURISTIC EVALUATION

3.1 DEFINITION WIKAPEDIA.COM

A heuristic evaluation is a usability evaluation method for computer software that helps to identify usability problems in the user interface (UI) design. It specifically involves evaluators examining the interface and judging its compliance with recognized usability principles (the "heuristics"). These evaluation methods are now widely taught and practiced in the New Media sector, where UIs are often designed in a short space of time on a budget that may restrict the amount of money available to provide for other types of interface testing.

The main goal to heuristic evaluations is to identify any problems associated with the design of user interfaces. Usability consultant Jakob Nielsen developed this method on the basis of several years of experience in teaching and consulting about usability engineering.

Heuristic evaluations are one of the most informal methods of usability inspection in the field of human-computer interaction. There are many sets of usability design heuristics; they are not mutually exclusive and cover many of the same aspects of interface design.

Quite often, usability problems that are discovered are categorized according to their estimated impact on user performance or acceptance. Often the heuristic evaluation is

conducted in the context of use cases (typical user tasks), to provide feedback to the developers on the extent to which the interface is likely to be compatible with the intended users' needs and preferences.

Most heuristic evaluations can be accomplished in a matter of days. The time required varies with the size of the artefact, its complexity, the purpose of the review, the nature of the usability issues that arise in the review, and the competence of the reviewers. A criticism that is often levelled at heuristic methods of evaluation is that results are highly influenced by the knowledge of the expert reviewer(s).

3.2 First Pass Evaluation

The car stereo/CD player is a universal device that is available in some form or other in every car produced. When driving, sometimes a quick glance is all the driver can afford to give their car stereo. Therefore, having a device that is intuitive, with a shallow learning curve and where information required is translated at speed by the user is of vital importance.

The first pass evaluation was used to familiarise the group, involved in the evaluation, with the device Sony CDX-S11. Each member of the group evaluated the device in isolation. The device, in its docked instance, was assessed from within the confines of a car in its natural environment. The evaluators spent a minimum of 30 minutes each, evaluating and assessing the device. There were two stages of during this evaluation. The first was when the device was in Radio Mode and the second was when it was in CD Mode.

3.3 SECOND PASS EVALUATION

This second pass evaluation required the group as a whole to discuss their findings as discovered in the first pass evaluation. The objective of this evaluation was to focus on those aspects of the device that appeared to cause the most adversity. It was also conducted in conjunction with the users manual supplied with the device. It was noted that most first time users tended to avoid those situations on the device that were not clear and these items were the main focus of discussion during the second evaluation.

3.4 EXPERT FEEDBACK

3.4.1 Power "On"

The car stereo is not *"On"* even when the key is in the ignition of the vehicle. The user still has to turn the system on. Locating the *"On"* button was very complicated. Much fiddling and pressing of buttons ensued. It was eventually discovered that the button that labelled *"Source"* was also the "On" button. This button was also used to switch from CD to Radio. The possibility of keeping the power button and the switch button separate was made. This button should also be labelled with the universal symbol for power (line breaking the circle). Also suggestions were made to incorporate symbols instead of text on many buttons.

3.4.2 Display Screen

The display screen was of a poor size. It was noted that the text displayed on the screen was of a pale uniform colour. It was suggested that the colour could be of a more luminous brighter colour and perhaps that the colour could change according to the setting the device was on. It was also suggested that an Equaliser, which reacted to the audio being used, on the display screen would be an added feature and provide interaction with the user. A suggestion was made to change to an LCD screen. The

text that was displayed at any point was apparent and conveyed the message required in a clear and concise manner.

3.4.3 Text on Buttons

Initial viewing showed too many buttons in the control area. There were grooves that were made to look like buttons, when buttons might have been of more use. It was noted that text was very small on the buttons. The font colour (too light) and size did not lend itself to being quick to read at a glance. The numbers on the buttons were a good size. Abbreviated text displayed on many of the buttons led to confusion as opposed to clarity of understanding with regards the function of the buttons.

No understanding for the button labelled “ATT” and “SENS”. Also the meaning behind the buttons labelled AF/TA was not clear. The meaning on the button labelled “BTM” was not clear. The button labelled “PTY” was not clear and it was felt that renaming the button, Pop or Visual might be a better title. The “DIM” button, the function of, which not clear initially, required the user to hold it down to activate it. The button labelled “Sel” would be more aptly named Bal(Balance), Fade (Fade In, Fade Out) or LVL (Audio Levels). Mode changed the device from FM to LW to MW in radio only.

The area of the device labelled “Seek” was actually not a button but just the text to describe the seeking button which was located to the right of the text. An “Arrow” described the button itself. This was very confusing and did not match much of the rest of the device for having the text either, on the button, or above the button.

There was an abundance of overloading on buttons, as the space utilized by the device was very limited. However, what was not clear was how to switch between the

different uses of the buttons when overloading was evident. To save the radio stations to the device it was necessary to hold down a numbered button. This was not an intuitive course of action.

The user would tend to mix up the when using the buttons on either side of the device. These were the “Volume +- “, buttons and the “Seek +-“, buttons. The evaluators were often pressing the “Seek” buttons when attempting to affect the volume. There was no definition of what the volume switches are even though this would be a primary function
of the player.

The “REP” and “Shuffle” buttons were only available when in CD mode. There was no clear button to establish how the user would switch between the Manual and Automatic station search settings when in the Radio Mode.

3.4.4 Ejecting From Cradle

A major problem that cropped up was the “Eject from Cradle (EC)” function. This involved the user pressing a large button on the bottom left of the device. This button was very sensitive and would eject the device with the lightest touch. This became a problem when the user would be pressing the volume buttons which were located directly above the “EC” button. The majority of times when the volume was pressed the device was ejected as the user either, accidentally pressed the eject button or touched off it in passing their finger to the volume button. Having a major and common use button next to the eject button would need to be altered.

3.4.5 CD Player Mode

Locating the CD input tray required more than a quick glance. There exists the possibility of making the inset area a different colour. When the device is in CD player mode there is no pause or stop button. The tracks on the CD play automatically. The player remembers the position on the track if switched off or switched to radio. However, the user cannot pause or stop the track. The user cannot jump up to different tracks when playing a CD. There is only the option of "Seek". On the first pass it was noted that the evaluators assumed that the numbers on the device which establish memorized radio station presets, would also work in the CD player for the skipping of tracks.

The button "ATT" appeared to drastically lower the volume. However, this did not work when the volume was high. The numbered buttons served no purpose while being operated in CD mode.

4 CHAPTER: HEURISTIC MODALITY FINDINGS

4.1 INTRODUCTION

The data collected by evaluators following individual inspection of the interface is compiled and illustrated through the utilisation of the Ten Principles for Heuristic Evaluation, formulated by Jakob Nielson. The following section intends to detail both general and intricate interface design problems of the Sony CDX-S11 and highlight key elements of the design which the redesign will focus on alleviating.

4.2 VISIBILITY OF SYSTEM STATUS.

The Sony CDX-S11 informs the user of its actions through its screen situated in the direct centre of the player measuring (W) 9cm x 1.5cm (H)

The screen acts as the primary indicator of what is going on with the system displaying appropriate feedback of the current status of the system and instantaneously illustrating any changes in settings.

Evaluators collectively believe that the screen is quite small, particularly from the Point of View of the driver, thus posing a constant safety risk of operating the system in transit.

This is of no consolation to the driver of an automobile, who needs to swiftly recognize any changes in the current settings before reverting their attention back to the priority of focusing on their driving.

4.3 MATCH BETWEEN SYSTEM AND THE REAL WORLD.

According to Nielson's Ten Usability Heuristics, the abovementioned principle entails that the system speaks the user's language using straightforward language and avoids system specific engineering terms.
(http://www.cc.gatech.edu/computing/classes/cs4753_94_fall/handouts/heur.eval.html
)

The Sony CDX-S11 is overloaded with many bland functions displayed by poor abbreviations. Thus, it is questionable whether some buttons serve any useful purpose to the system.

The above functions serve very little purpose and are abbreviated by language that is quite difficult to understand. It is only through further inspection from the User Manual, that these functions become apparent. “DSPL” changes display items on the screen while ‘DIM’ acts as a display brightness tool (dimmer) The group suggested that these functions could be better conveyed by possibly re-phrasing the Display function as “DISP” and changing the Display brightness function to a brightness symbol e.g. The “SENS” button acts as a function to counteract weak radio reception. While the group acknowledges that these functions are quite useful and present a competitive advantage over competitors products, they could be possibly redesigned in conjunction with Nielson’s heuristic of “Aesthetic and minimalist design”.

Similar confusion surrounds the function of the AF/TA (alternative frequency/ traffic announcement) button. The evaluators admitted they could not understand this function and once more, the User manual was summoned. This opens up the debate of

whether such functions should be discarded to make the device more straightforward to operate
(Interaction Design, Preece J, Rogers Y, & Sharp H, 2002, John Wiley & Sons, New York)

4.4 User Control and freedom

The majority of evaluators pointed out their concerns that the relatively small screen featuring just one line of text display greatly limited interactivity with the system.

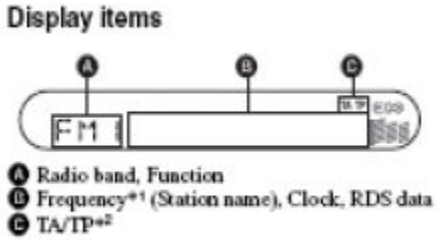
Evaluators expressed confusion at turning the system as there is no clearly marked Power button. Essentially, the "Source" key powers the stereo (accompanied by an added "OFF" button) on but there needs to be a clearer symbol recognizable to eradicate any confusion by the user.

Evaluators also found it difficult to distinguish between the Volume levels and the CD track/ channel seeker until closer inspection. Taking road safety into consideration, these commonly used functions require greater transparency in order to minimize a driver's distraction from their journey. Addressing the definition of these two highly used functions will be an important element in the redesign of the system.

An additional setback to the functionality of the radio player was the inability to instantly correct any changes made to the six preset radio channels. Users are not presented with a confirmation screen or an Undo function to rectify any mistakes they may have made.

4.5 CONSISTENCY AND STANDARDS

The LED screen of the Sony CDX-S11 adequately displays current actions in upper case, centred data. In general, the actions learned in one part of the system can be applied in another aspect of the system. However, the relationship between radio and CD mode is not clearly expressed. In addition, the Sony CDX-S11 uses different words than many other similar products to represent actions. For example, the balance of audio levels (fade, Panning etc) is represented as a "Sel" button on the top right hand corner of the interface. This can often be confused with the "Disp" button which displays digital information on the current actions. Renaming one of these buttons was considered the best amendment to make to the prototype to assure users that these are two distinct functions.



Picture courtesy of Sony CDX-S11 User Manual

4.6 ERROR PREVENTION

It is important that the new prototype of the Sony CDX-S11 is designed carefully so that previous errors can be prevented. Certain elements of the physical layout of the Interface needed to be revised in order to eradicate unforeseen problems.

Eject from CD cradle.

A large button on the bottom left corner of the screen allowed the user to take the interface from its working position. However, the button is situated right next to the Volume (lower) button and is extremely sensitive, ejecting at the slightest touch and powering off the player unexpectedly. Thoughtful consideration would have to be made in order to eliminate this common error without transforming the interface completely.

As mentioned earlier, the availability of a confirmation window allowing the user to cancel certain actions just before execution will greatly limit the number of potential errors from occurring.

4.7 RECOGNITION RATHER THAN RECALL

The relative small size of the LED screen (9cm x 1.5cm) only serves to offer the user very limited information on tracking changes in the system. However, it also means that the user has very little information to recall when returning to previous actions. Therefore, the input of a larger colour screen would help to display more detailed information to the user using a possible combination of words, objects and actions that would be more consistently recognized and recalled by the user.

The magnitude of extra functions on the Sony CDX-S11 also translates that the accompanying User Manual is a valuable tool in navigating through endless functions, particularly when in radio mode. Functions such as AF/TA, PTY and SENS all require multiple performances, backed up by Manual reference, in order to successfully recall the function for future use.

4.8 Flexibility and Efficiency of Use

As the Sony CDX-S11 does not offer any "add-ons" there is very limited scope for flexibility within the system. The 6 preset channels on the body of the player allow the user to create instant shortcuts to their favourite radio channels. The addition of the SENS/BTM buttons even allow for coverage in areas of weak reception. Strangely however, the pre-set radio channels would sometimes default back to the lowest frequency on the FM scale without any apparent cause.

4.9 Aesthetic and Minimalist design.

Perhaps the Sony CDX-S11's biggest disadvantage is the cluttered interface of buttons on the base of the player. Furthermore the volume buttons were not illustrated clearly, with barely recognizable symbols.

While the display screen follows a minimalist design, there is scope for improving the illumination of the screen to improve both aesthetics and navigation.

While the player operates in CD mode, all information is captured on a solitary line of display. Therefore, it can often be difficult to segregate different display items in an interface that is limited space wise. It was noted that the text displayed on the screen was of a pale uniform colour. It was suggested that the colour could be of a more luminous brighter colour and perhaps that the colour could change according to the setting the device was on.

4.10 Help users recognize, diagnose, and recover from errors

System users are advised to consult the User Manual to attempt to correct errors encountered whilst operating the machine. Due to the limited functionality of the

system, there are not many errors that can occur. If the manual fails to rectify a specific error, the hapless user is given little alternative but to tweak as many buttons as possible until functionality returns to normal. The downside to the abovementioned action is the various alterations to pre-settings which one may have unintentionally executed. Finally, the frustrated user must remember that errors that deal with radio signals and reception strength are often beyond the control of the user.

4.11 HELP AND DOCUMENTATION

Assistance for any problems or errors encountered whilst using the system is available through a Troubleshooting section in the User Manual. (Written in English, German, French, Italian and Dutch) It is divided up into 3 sections, General, CD playback and radio reception. The manual also lists a number of error display messages that may arise, accompanied by solutions for counteracting the errors.

Failing all this, Sony reluctantly informs the user to take their player to the nearest Sony dealer for consultation. The lack of an online help or call centre for Troubleshooting is a problem which users only cover after purchasing the system.

5 CHAPTER: THE PROTOTYPE

5.1 MODIFICATIONS & PROTOTYPING

Prototyping is used to test the function of a new design prior to implementing production of a product. It is a cost effect method of testing and evaluating the product to ensure it is functioning as desired. Alterations are then incorporated into subsequent prototypes until complete approval is achieved, and the product is available for mass production.

Subsequent to the evaluation of the car stereo, the group made a number of informed assessments and decisions as to what modifications would be required. Alterations and modifications to be applied to the actual system were generated in a medium fidelity prototype designed and developed using Adobe Photoshop and Adobe Macromedia Flash 8 actionscript application software. Discussion of changes to be made, after first and second pass evaluations, and applied to the prototype, included the following elements.

5.2 UTILISATION OF SPACE

From discussions with the group and through user evaluation, a number of display and layout suggestions were prepared. The first was the amount of space not being utilised. Suggestions were prepared as to how this could be addressed in a positive manner without loss of function or aesthetics. These included modifying the angle bracket designed sides in the main display and increasing the quantity of surface area available for use.

The dimensions of the display screen was also increased by relocating the text *"SONY",* to above the CD input tray, and by transferring the overload commands, on the numbered buttons beneath the display area, to below the buttons themselves. The company logos and system information text were also moved to outer edges of the panel to utilise more space without the loss of their importance and positioning throughout the device.

The removal and/or alteration of certain function buttons also took place. The OFF and MODE buttons were removed; the SEL button was renamed BAL; the SOURCE button was renamed Radio/CD and the power symbol was added to a newly generated Power button. The buttons, ATT, EQ3, and SENS were transferred to the main

display area of the stereo. The button labelled PTY was relocated next to the numbers panel. The DSPL button was renamed with a sunshine symbol and redistributed to the right hand side of the numbers panel. AF/TA was relocated to the left hand side of the numbers panel. The Volume and Seek buttons were enlarged and transferred to the main design area. The CD Eject button was altered and was exchanged, regarding location, with the logo for Compact Disc Audio.

1.1.1 Original version demonstrating sides in angle bracket design, original button configurations, and button titles, screen size, display type and logo placement.

1.1.2 Modified version demonstrating utilisation of space available and alteration to angle bracket design, button configurations, display alterations, screen size and logo transfer.

5.3 FUNCTION BUTTONS

5.3.1 "On" Button

When viewing the original device, it was noted that the initial evaluators experienced some dilemma locating the Power/On button. The button was labelled "*Source*" and this was also the button used to switch from Radio to CD. In the prototype the device was modified to include two new buttons to replace the Source button. The universal symbol for Power On/Off was also incorporated as it was felt during discussions that this symbol was more easily understand than "*Source"*. The Source button was now the button labelled *"Radio/CD",* and was placed directly underneath the newly constructed On(Symbol) button to enable the user to clearly identify in a relatively short time where the control for the power and switch buttons were located.

5.3.2 1.1.3 Original Source Button 1.1.4 Modified Radio/CD and

5.3.3 Volume & Seek Buttons

Evaluation of the original device established that the user had difficulty utilising the Volume and Seek buttons. The Volume buttons in particular were problematic. Quite often the user would accidentally hit off the Eject from Cradle button located in the

bottom left corner of the device. This would cause the whole device to undock from the car stereo system.

1.1.5 *Display of volume buttons in original state demonstrating relationship to eject form cradle button.*

1.1.6 *Eject from Cradl*

1.1.7 *Display of Volume Buttons in modified version demonstrating location to*

5.3.4

5.3.5 Repeat & Shuffle Buttons

The REP and SHUF buttons remained in the same location as on the original, on preset buttons 2 and 3. However, in accordance with the desire to utilise more space on the display area, the overload button text titles were moved beneath the preset buttons. As an added feedback mechanism, the prototype also incorporated symbols to enhance the users experience when selecting these functions.

1.1.8 *Original Rep & Shuf Buttons text*

1.1.9 *Modified prototype Rep & Shuf*

5.4 DISPLAY SCREEN

The screen in the display area was enlarged from the original dimensions to allow for additional icons and graphics to be demonstrated to the user. Suggestions were offered to alter the text colour from pale grey to a vivid luminous shade of blue. An option of incorporating an LCD screen was also suggested. Simply adjusting the colour of the text in the resized screen allowed the user a clearer view of the text being displayed despite the font size remaining the same.

Additional animated graphical designs were incorporated into the display screen. These included an icon with a rotating CD to demonstrate that a CD was in use, and an interactive equaliser. Both the CD and Equaliser icons in the original design were static and had very little scope in the display screen. It was considered that static icons relayed insufficient feedback to the user.

1.1.10 Display screen including static icons, and compacted view in original

1.1.11 Display screen of prototype demonstrating display screen colour, and animated icons.

The "*Track"* information displayed, when in CD Mode, was also rearranged, in the prototype, to be situated above the main text on display. A final adjustment to the prototype, to ensure as authentic a situation as possible, involved adding pre-recorded CD Tracks and Radio preset stations to the prototype.

5.5 ADOBE PHOTOSHOP, MACROMEDIA FLASH 8, AUDACITY

Photoshop was used to create the initial prototype images which would later be imported into Flash. The buttons that would need to be functioning through the Flash prototype were kept vacant in the Photoshop image. The display screen was also left empty.

Flash was used to create the functioning buttons on the prototype. It was also used to create the animated icons and display text. Actionscript was used to control how the buttons would react as if in a real-time environment.

Audacity was used to mix and establish Track and Radio music. This enabled the prototype to maintain an air of authenticity.

5.6 CONSTRAINTS

Due to technical and time constraints not every alteration and suggestion made during the evaluation process could be incorporated into the prototype. The controls were kept to the primary functions as would be used by a car driver.

6 CHAPTER: EMPIRICAL EVALUATION

6.1 COOPERATIVE EVALUATION SETUP

Following the completion of a fully operating prototype of the new Sony CDX-S11, the next step in our evaluation required the recruitment of a number of users to perform a cognitive walkthrough of the medium fidelity prototype. A detailed Task List was then drafted up, which requested users to perform a sequence of actions which tests various functions of the system. The tasks would test general player functions, radio functions and CD playback functions. We have set the evaluation so the user can explore the systems functionality hands on, while providing feedback on each step of the Tasks assigned to confirm whether that step is beneficial or a hindrance to a new user.
(http://www.cc.gatech.edu/computing/classes/cs3302/documents/cog.walk.html)
CS 3302 Introduction to Software Engineering, Winter 1995. Gregory Abowd.
Performing a cognitive walkthrough

The task evaluation was conducted in the Interactive Media lab in CS2-046 on Friday 15th December 2006, by which time a working Flash prototype was functioning on both laptops and workstations. When recording our data, we also decided to use a minidisk recorder to capture the Task evaluation. Participants were also "think aloud" throughout the experiment to enhance this co-operative evaluation exercise. Having users as co-evaluators during this crucial stage of the design process ensured that the maximum number of problems could be detected.
(The Use of think aloud evaluation methods in design, Peter C Wright, Andrew Monk SIGCHI Bulletin, January 1991, Volume 23, Number 1)

6.2 USER TASK LIST

The task list was drafted up with the inexperienced user in mind and set out predominantly basic functions for Users to follow in order to familiarize themselves with the new system. The new prototype was presented to users on a laptop. The interface of the existing artifact and its User Manual were also available as resources during the Cooperative evaluation stage.

6.2.1 Task 1: Turn on device

The addition of a power button to the new prototype was anticipated to erode much confusion over the powering of the existing artifact.

6.2.2 Task 2: Play CD

The dual function button of Radio/CD is a new feature of our system providing effortless transition between radio and CD playback.

6.2.3 Task 3: Skip to Track 3

Our improved Seek Track buttons will make it easier for users to distinguish between Tracking and volume controls.

6.2.4 Task 4: Press Repeat

Switching the Repeat ("Rep") function from the digit '3' to digit '2' aimed to give the user the logic that by clicking on '2', they wanted to listen to a track twice.

6.2.5 Track 5: Shuffle tracks

The Shuffle function was moved slightly to its new position alongside the Repeat function in order to maintain the function grouping of the existing artifact.

6.2.6 Task 6: Switch to Radio

Again, the addition of the Radio/CD button allowed the user to change back to radio mode with minimal problems.

6.2.7 Task 7: Go to Today fm via preset 2

Pre setting of the main radio stations entails that the user need only skip between the six channels to find Today fm as a saved channel.

6.2.8 Task 8: Decrease volume

A Volume label (abbreviated "VOL") was added between the volume controls to identify this important function. A decrease in volume would be displayed accordingly to the user.

6.2.9 Task 9: Turn off device

The power button ensured that the system could be shut down easily and removes the need for a separate "Off" button.

6.2.10 Task 10: Identify the state of the device from screen prompts and comment on the new display.

Descriptive pre loaded text and integers would effectively inform the user of actions completed. Comments on the new display are made in conjunction with comparative analysis of the existing artefact.

6.3 USER PROFILE

6.3.1 User 1

Evaluation Date	18/12/2006
Sex	Male
Age	23
Occupation	Postgraduate student
Prior knowledge of Sony CDX-S11	No
Prior knowledge of another In Car system	Yes. Custom made CD player for Citroen

6.3.2 User 2

Evaluation Date	18/12/2006
Sex	Male
Age	30
Occupation	Post grad student
Prior knowledge of Sony CDX-S11	No
Prior knowledge of another In Car system	Yes

6.3.3 User 3

Evaluation Date	18/12/2006
Sex	Female
Age	22
Occupation	Undergraduate Student
Prior knowledge of Sony CDX-S11	No
Prior knowledge of another In Car system	No

6.3.4 User 4

Evaluation Date	18/12/2006
Sex	Female
Age	19
Occupation	Undergraduate Student
Prior knowledge of Sony CDX-S11	No
Prior knowledge of another In Car system	Yes. Blaupunkt system (Ford Fiesta)

6.3.5 User 5

Evaluation Date	19/12/2006
Sex	Female
Age	20
Occupation	Undergraduate student
Prior knowledge of Sony CDX-S11	No
Prior knowledge of another In Car system	No

6.3.6 User 6

Evaluation Date	19/12/2006

Sex	Male
Age	61
Occupation	Senior Lecturer
Prior knowledge of Sony CDX-S11	No
Prior knowledge of another In Car system	Yes

6.3.7 User 7

Evaluation Date	19/12/2006
Sex	Male
Age	43
Occupation	University Porter
Prior knowledge of Sony CDX-S11	No
Prior knowledge of another In Car system	Limited knowledge of own system.

6.3.8 User 8

Evaluation Date	19/12/2006
Sex	Male
Age	44
Occupation	Postgraduate Student
Prior knowledge of Sony CDX-S11	No
Prior knowledge of another In Car system	Yes. Custom built in player for Volvo 0

6.4 PERFORMING THE TASKS

As outlined above, the Task lists were enacted by 8 different users based at the University of Limerick. Our sample range represented a broad section of the

University community and included undergraduate students, postgraduate student, academics and non-academic staff. Each task evaluator also signed a declaration of informed consent before undertaking the Task list in order to give him/her full awareness of the research project they have just agreed to contribute to. Finally, we omitted printing the names of our Task evaluators for comfort of anonymity to those involved.

6.4.1 User 1

Task 1 Turn on device The user instantly identified the Power button and switched the system on without any difficulty.
Task 2 Play the CD Having informed the User that a CD was already inside the system, they located the CD function wit ease, pressing Radio/CD with a Track number acknowledging their action.
Task 3 Skip to Track 3 At first, the user mistakenly clicks the digit '3' at the bottom of the interface. Realising their error they then click on '>>' button (Seek Track forward) which yields a result.
Task 4 Repeat Track 3 The User recognizes the abbreviation "REP" on the interface. On clicking the digit '2', the loop symbol on the screen assures the user he has completed this task.
Task 5 Shuffle Tracks The previous task has the user to the Shuffle function adjacent to the Repeat function. The 'Crossing arrows' assures the user that the CD has been set for shuffling.
Task 6 Switch to Radio The user once again clicks on the Radio/CD button and successfully returns to the radio function.

Task 7 Go to Today FM via preset 2 As the user immediately begins skipping through the six presets, it is not long before he successfully accesses Today Fm on preset 2.
Task 8 Decrease Volume The User intuitively selects the minus button on Volume control and selects it repeatedly. His actions are acknowledged by a descending Volume level on the LCD screen
Task 9 Turn off device The user swiftly deactivates the system by clicking on the Power symbol, to which the system responds by shutting down.
Task 10 Identify the state of device from screen prompts and comment on the new display The user does not recognize a number of buttons from both the prototype and the existing artefact, and cites the importance of the User Manual in explaining some obsolete functions of the system. The User is also distracted by the rapid flickering of text on the LCD screen, suggesting that screen prompts should be presented concisely and statically.

6.4.1.1 Review

Overall, the user is generally satisfied with the restructured layout of the Sony CDX-S11. In particular, they admire the relocation of the CD eject button next to the CD tray, which instantly uncovers the function of the buttons. The user also commends the greater elevation of the buttons and the larger LCD screen, for improved performance and feedback. Interestingly, the user made a useful suggestion that designer try to eliminate any grooves that look like buttons but overall is impressed with the new prototype.

6.4.2 User 2

Task 1 Turn on device The user clicks the Power button and activates the system without any difficulty
Task 2 Play the CD The user switches to CD mode effortlessly.
Task 3 Skip to Track 3 The user swiftly completed this task by scrolling along the >> seek button until receiving confirmation on the LCD screen that Track 3 was currently playing.
Task 4 Repeat Track 3 The User imports their experience of audio systems to click on the digit '2' while a looping symbol confirms his action has been successful.
Task 5 Shuffle Tracks The User correctly identifies "SHUF" as the Shuffle function on the system and clicks on the digit '3' to shuffle the CD tracks
Task 6 Switch to Radio By pressing the Radio/CD button, the user has successfully navigated from CD mode to Radio mode without any hesitancy.
Task 7 Go to Today FM via preset 2 The User browsed through the preset channels and pressed the digit '2' on the interface, the screen prompt confirming that he had selected the requested station.
Task 8 Decrease Volume The User states that he would be naturally inclined to click on the Minus tab of the Volume controls. His action is once again confirmed by a descending Volume level on the screen of the interface.
Task 9 Turn off device The User clicks the Power button once to power off the system.

Task 10 Identify the state of device from screen prompts and comment on the new display The User comments that the increased size of some buttons on the new prototype have allowed a number of the major functions of the system to become much more apparent. The blue LCD screen also makes the system more aesthetically pleasing.

6.4.2.1 Review

In the Users opinion, the clarity of the Volume Control buttons has had a beneficial impact on operating the system. The user was also encouraged that the inclusion of a On/OFF button has made the system a lot easier to power from a drivers perspective, allowing uncomplicated control while driving.

6.4.3 User 3

Task 1 Turn on device The user switched the system on without any problems.
Task 2 Play the CD The user confidently clicked the Radio/CD button to be transferred to CD mode.
Task 3 Skip to Track 3 Without hesitation, the user pushed the “>>” Seek to quickly navigate their way onto Track 3 of the CD.
Task 4 Repeat Track 3 The user hesitated on this task and remarked that the repeat function was quite difficult to locate. On further investigation, they spotted the appropriate icon and selected the Repeat function for Track 3.
Task 5 Shuffle Tracks

The User simply pressed the digit '3' on the interface and identified the Shuffle symbol on the LCD screen confirming their action.
Task 6 Switch to Radio The user had no problems reverting back to radio mode through the Radio/CD button.
Task 7 Go to Today FM via preset 2 The user quickly accesses Today FM through the six radio presets on the interface.
Task 8 Decrease Volume By pressing the minus button on volume control, the user successfully reduces the volume of the system, highlighted in text on the LCD screen
Task 9 Turn off device The user turns off the system conveniently through a simple click of the Power button.
Task 10 Identify the state of device from screen prompts and comment on the new display The user confesses that she cannot understand the function of the EQ3 but does commend the newer display commenting that it had been difficult to differentiate between Volume and Tracking on the existing artifact.

6.4.3.1 Review

The User expressed her satisfaction at the appearance of familiar symbols, to indicate that certain actions had been performed. The modification of a larger LCD screen with blue graphics helped to improve interaction between the user and the system. The User did however claim that she was unaware of the BTM, SENS, PTY and ATT functions and questions whether we should exclude these functions or group them to accommodate a minimalist design.

6.4.4 User 4

Task 1 Turn on device The user established system power by pressing the Power button.
Task 2 Play the CD By clicking on Radio/CD button, the user easily completes the second task.
Task 3 Skip to Track 3 Once more, the user efficiently toggles the >> track seek button to play Track 3 of the CD
Task 4 Repeat Track 3 The User has no difficulty in identifying REP as the repeat function, with their actions confirmed by a Looping symbol located at the top of the screen.
Task 5 Shuffle Tracks No hesitations here as the user correctly identifies the SHUF icon as the command by which to shuffle the CD tracks.
Task 6 Switch to Radio The user clicks the Radio/CD button to redirect them back into Radio mode.
Task 7 Go to Today FM via preset 2 The user clicks on the digit '2' and is notified through the screen prompt that she has located Today FM.
Task 8 Decrease Volume The decreasing volume button is identified and the volume appropriately lowers.
Task 9 Turn off device No problems here as the user clicks the power button once to turn the player off.
Task 10 Identify the state of device from screen prompts and comment on the new display New system is much clearer and there is no confusion on how the system is powered on. The LCD screen promotes greater feedback than the smaller screen of the existing artifact

6.4.4.1 Review

The user successfully navigated their way around without hesitating on any of the tasks above. They state that problems with navigation had been eliminated through a larger screen on the prototype.

6.4.5 User 5

Task 1 Turn on device Power was achieved through a single click of the Power button.
Task 2 Play the CD The user immediately pressed the Radio/CD button to access the CD
Task 3 Skip to Track 3 The user proceeded directly to Track 3 by clicking on the >> seek button
Task 4 Repeat Track 3 The confusion of some of the previous users was mirrored as the user took some time to identify the 'repeat' abbreviation. It was eventually located and selected.
Task 5 Shuffle Tracks The Shuffle abbreviation was quickly identified and activated by the user.
Task 6 Switch to Radio The user was back in Radio mode with just a simple click of the Radio/CD button
Task 7 Go to Today FM via preset 2 The user used their knowledge of existing car CD players to swiftly locate Today FM on the radio presets of the player.
Task 8 Decrease Volume The volume of radio was decreased quickly and simply through application of minus volume control.
Task 9 Turn off device No complications arose here as the device was quickly powered off by clicking the Power

button.
Task 10 Identify the state of device from screen prompts and comment on the new display The user commented that the new, larger screen will have an additional benefit to drivers controlling the system. The user's uncertainty about the Volume/ Seek functions on the existing artefact has been eliminated through an improved interface display on the new interface. However. The user does express some concern about the use of some functions, questioning their value as distinct buttons on the interface.

6.4.6 User 6

Task 1 Turn on device The user spotted the Power button and switched the system on easily. They acknowledged that the system has defaulted onto radio and prepared for the next task.
Task 2 Play the CD Having been asked to visualize that there was a CD in the player, the user instantly pressed the Radio/CD button, to which the system transferred onto CD mode.
Task 3 Skip to Track 3 At first, the user attempted to play track 3 of the CD by pressing the digit '3' on the bottom of the interface. As this action was incorrect, the user implemented his alternative choice of locating track 3 through scrolling through the '>>' icon under Seek to which the track was finally located.
Task 4 Repeat Track 3 Once again, the REP symbol was recognized as the Repeat function, and a corresponding loop symbol appeared to highlight the action.
Task 5 Shuffle Tracks

Similarly to the repeat function, the user correctly identified 'SHUF' as the shuffle function and easily shuffled the tracks by pressing the digit '3' on the interface.
Task 6 Switch to Radio The straightforward task of switching back to radio mode was achieved by the users contact with the Radio/CD button.
Task 7 Go to Today FM via preset 2 The user, now aware from earlier errors, that the digits 1-6 programmed the preset radio functions located Today Fm by pressing the digit '2' on the interface, to which "Today FM" appeared on the screen.
Task 8 Decrease Volume The user pressed the minus volume button and recognized their action through the descending volume level on the screen.
Task 9 Turn off device The device was powered off without any difficulty.
Task 10 Identify the state of device from screen prompts and comment on the new display The user acknowledged that principle buttons and screen prompts were now more evident on the newer prototype and that were important tools for user feedback. The addition of the Power button was also hailed as an important upgrade on the existing artefact.

6.4.6.1 Review

The user found the prototype to be more aesthetically pleasing than the existing artefact and favours the revision of the volume and track- seek functions. The users' confusion surrounding the activation and deactivation of the device has been rectified by a modification so simple that they label it ingenious!

6.4.7 User 7

Task 1 Turn on device Power was achieved swiftly through the Power button on the top right side of the interface
Task 2 Play the CD The user located the radio/CD button and casually pressed it to activate CD mode.
Task 3 Skip to Track 3 The user simply pressed >> Seek twice and was brought to track 3 on the CD.
Task 4 Repeat Track 3 The user also recognized REP as the repeat function in CD mode. They acknowledged the loop symbol on top of the screen as a confirmation of their action.
Task 5 Shuffle Tracks The shuffle function was located with ease and was assured by the cross-arrow symbol to confirmation shuffling of CD tracks
Task 6 Switch to Radio The user clicked Radio/CD and was duly brought back into radio mode.
Task 7 Go to Today FM via preset 2 The user pressed preset 2 and identified that they had correctly located Today Fm through the screen prompt.
Task 8 Decrease Volume The user pressed volume down which resulted in an immediate reduction in the volume Again, the action was visibly and aurally recognized by the user.
Task 9 Turn off device The user pressed the volume down
Task 10 Identify the state of device from screen prompts and comment on the new display The user commented that both the buttons and symbols are far more distinct on the new

prototype than on the existing artefact. They also commend the colour catching and its aesthetic effect. As an appealing suggestion, the user recommended that the prototype could be improved with the addition of click sounds indicate that contact had been made with buttons or key changes had taken place.

6.4.7.1 Review

The user amassed very limited difficulty navigating through the system with clearly distinct buttons aiding the process. Interestingly, their recommendation for programming a click sound attached to many functions on the system is seen as valuable feedback for further modification on the prototype achievable through the co-evaluation of both task users and evaluators.

7 CONCLUSION

The objective of this project, from a group perspective was to construct a modified version of a system that had clearly defined design flaws. Additionally, the process was always followed according to the user Centred design process, integrating potential end users of the product into the redesign and functionality of the Sony CDX-S11. While we would have liked to have implemented more of the changes requested of us by task users, time constraints meant that this could not be fully achieved.

We found the addition of the Power switch button and the revision of the Volume and Track seek controls to be the most significant enhancement on the existing artefact. Users could now distinguish between major functions, arguing that the newer prototype had been made straightforward to control than the original.

Through the results of the questionnaire filled in by task users on completion of their Task evaluation, we received strong feedback on a number of important elements of the system.

- The display area was clear and understandable by users. Users observed that the increase in the size of the screen while keeping text and integers the same size offered them the addition of extra symbols and icons for improved feedback.
- Terminology throughout both the radio and CD modes remained consistent and easily understandable.
- Overall, users quickly adapted to navigation of the system and expressed confidence that they would accustom to the newer prototype much quicker than the existing artefact.

Future Recommendations.

A number of interesting suggestions were posed to use after the task evaluation session. Users recommend that they liked the concept of being able to identify actions

through universal symbols that were familiar with through similar devices. A further modification would seriously consider roll out of a broad spectrum of symbols and icons to give the user instant recognition of their action. Finally, the idea of a click sound after actions represents viable feedback for user interaction with the system. It bears particular importance when the system is being operated by the car driver. He/she ultimately must focus their attention on the road and requires as much feedback as possible without undue distraction.

8 REFERENCES

Human Factors in Software Development, Heuristic Evaluation Abowd Gregory 1994 (http://www.cc.gatech.edu/computing/classes/cs4753_94_fall/handouts/heur.eval.html) Date accessed 17/12/2006

Performing a cognitive walkthrough, Abowd Gregory. 1995 http://www.cc.gatech.edu/computing/classes/cs3302/documents/cog.walk.html Date accessed 17/12/2006

9 APPENDICES

9.1 Declaration of informed consent

I, the undersigned, hereby declare that I am willing to take part in a research project that is part of a course assessment for the CS6021 module, Foundations of Interactive Media at the University of Limerick. The nature of this study is as follows:

Title: Evaluation of the Sony CDX-S11 Car CD/ Radio player .
Purpose: In this study we intend to evaluate the Sony CDX-S11 Car CD/ Radio player in terms of its usability. This involves asking users to perform certain tasks offered by the system or product that are representative of the types of

tasks users would normally perform using this system and give feedback in terms of how usable or otherwise the system or product is.

I declare that I have been fully briefed on the nature of this study and my role in it and have been given the opportunity to ask any questions before agreeing to participate. I understand that my role in this evaluation is as a co-evaluator and that this is not an evaluation of my ability, knowledge or intelligence, rather it is an evaluation of the system or product in terms of its usability.

The particular tasks that I will be required to perform have been explained to me and I understand them. I also understand that that I will be required to "think-aloud" while performing these tasks. The "thinking aloud" method has been explained to me and I understand that no personal, private or confidential information is required from me.

I fully understand that there is no obligation on me to participate in this study and that I am free to withdraw my participation at any time without having to explain or give a reason. I am also entitled to full confidentiality in terms of the details of my participation and my personal details. I understand that some or all of the data (verbal and non-verbal) may be used (quoted) in the report on the evaluation for illustrative purposes but I shall not be identifiable from this data either in the body of the report or in appendices.

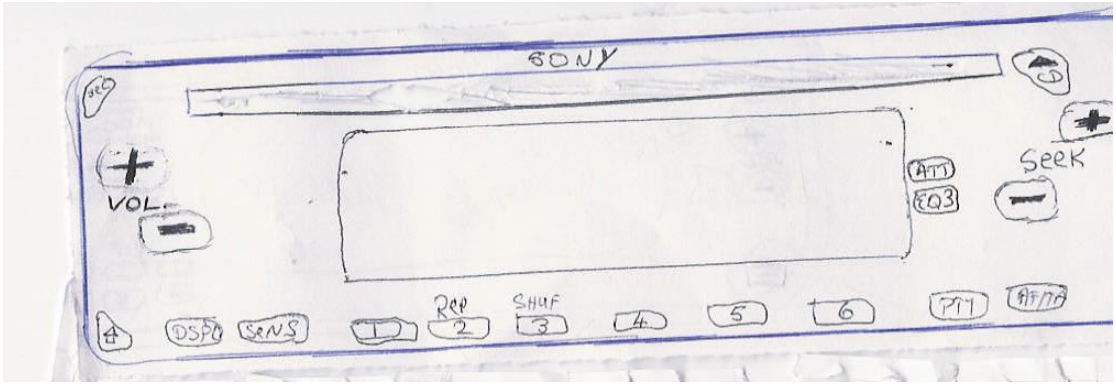
I also understand that my participation in this study may be recorded by video or audio means as well as in the form of notes taken by observers and I agree to this. However, should I feel uncomfortable with being recorded at any time, I can request that all recording equipment be switched off. I am entitled to copies of all recordings made during the session if I wish to have them.

I acknowledge the fact that deception and concealment are inappropriate to and not required in this study and that no attempt will be made to elicit information or actions from me using these means.

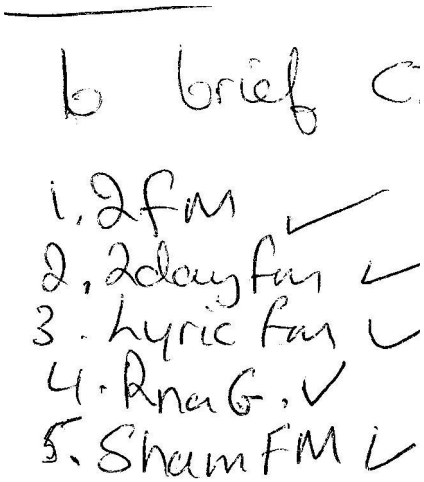
_____ _____

Signature of participant Date

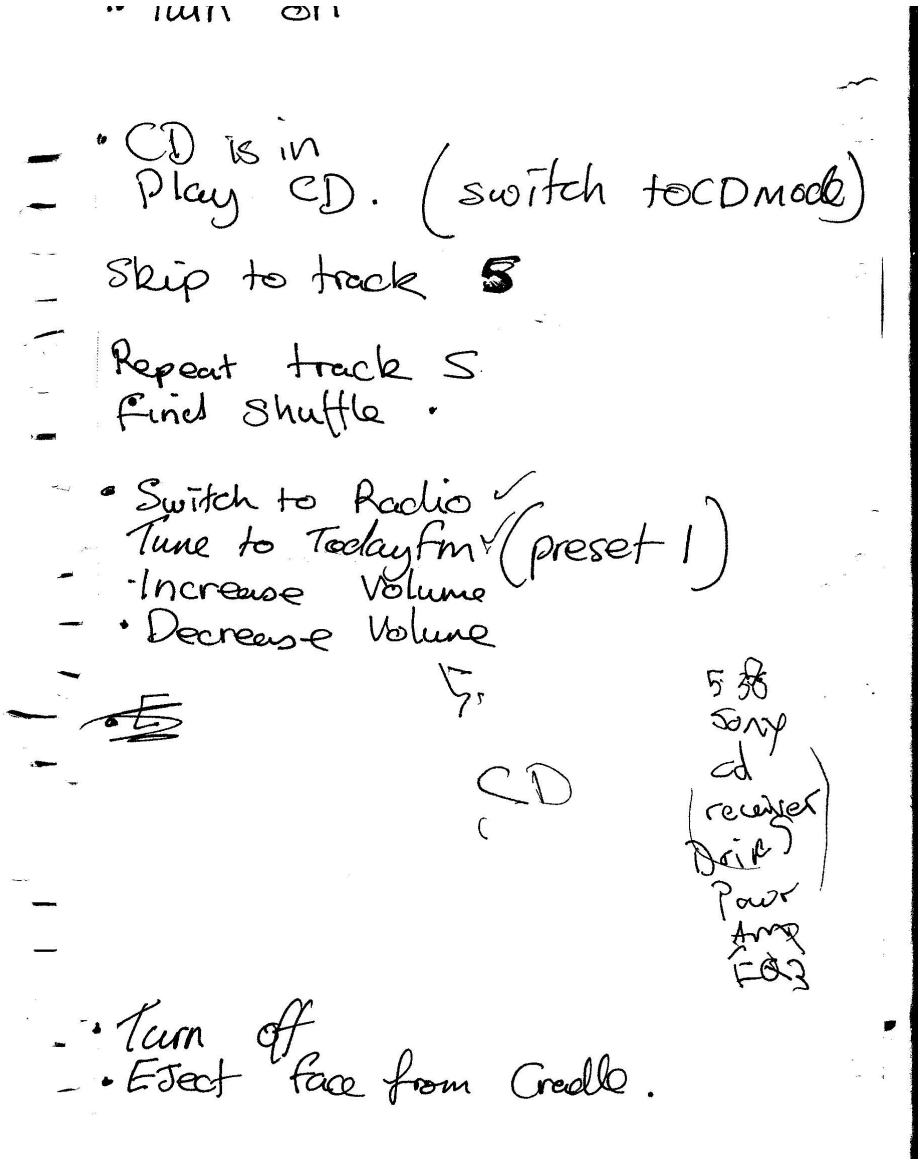
The following section details sketches, questionnaires and additional information that were incorporated into the project.



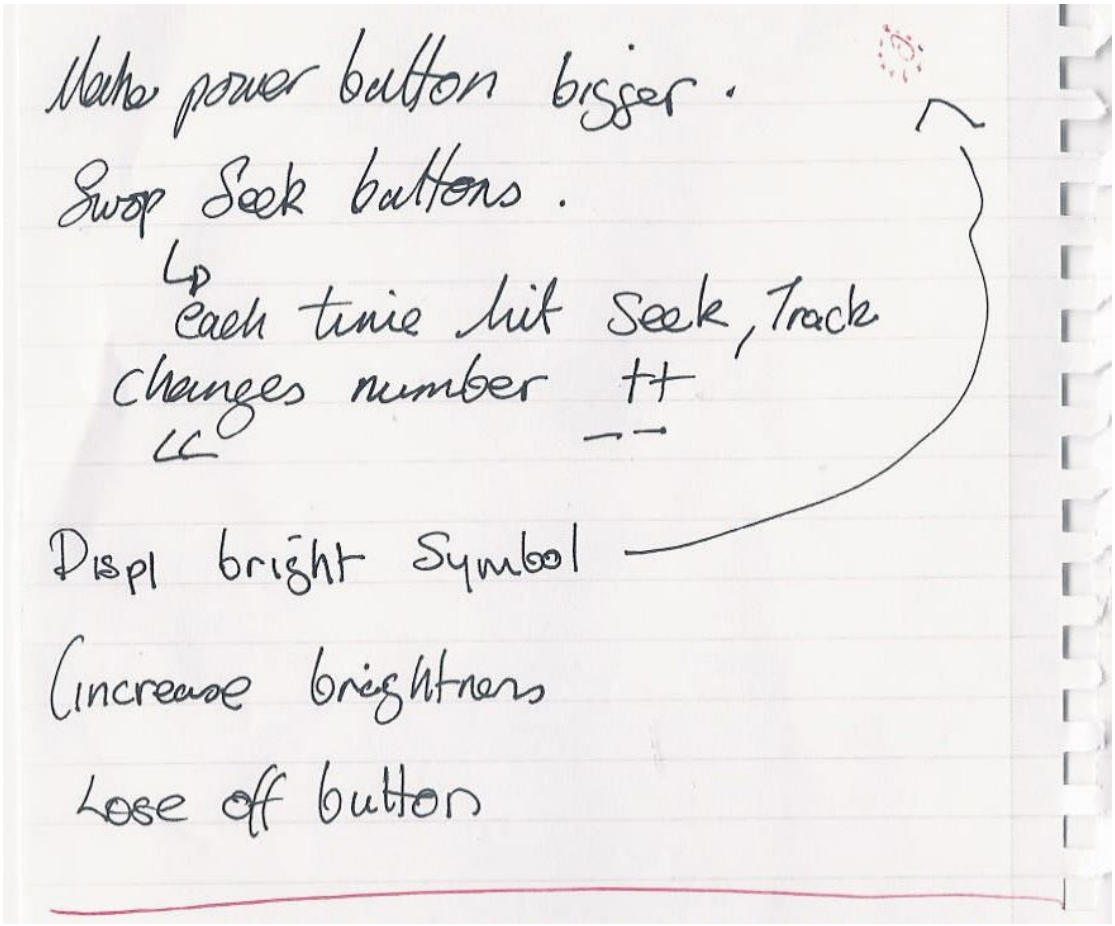
First stage of prototype construction



Audio Listings for Radio presets.



Initial Task List



Alterations to prototype

Questionnaire for User Interface Satisfaction

Please rate your satisfaction with the Device.

- Try to respond to all the items.
- For items that are not applicable, use: **NA**
- Add comments as necessary

9.1 OVERALL REACTION TO THE DEVICE:											
			0	1	2	3	4	5		NA	Comments
1.		Terrible							Wonderful		
2.		Difficult							Easy		
3.		Frustrating							Satisfying		
4.		Dull							Stimulating		
5.		Rigid							Flexible		
9.2 DISPLAY:											
			0	1	2	3	4	5		NA	Comments
6.	Reading characters on the Display	Hard							Easy		
7.	Highlighting simplifies tasks	Not at all							Very much		
8.	Organisation of	Confusing							Very Clear		

	Information										
9.	Sequence of Displays	Confusing							Very Clear		

9.3 TERMINOLOGY AND SYSTEM INFORMATION

			0	1	2	3	4	5		N A	Comments
10.	Use of terms throughout the device.	Inconsistent							Consistent		
11.	Terminology related to task	Never							Always		
12.	Feedback about progress	Never							Always		

9.4

9.5 .LEARNING

			0	1	2	3	4	5		N A	Comments
13.	Learning to operate the device	Difficult							Easy		
14.	Exploring new features by trial and error	Difficult							Easy		
15.	Remembering names and use of commands	Difficult							Easy		
16.	Performing tasks is straight-forward	Never							Always		

17.	Help messages on the display	Unhelpful							Helpful		
18.	Supplemental reference materials	Confusing							Clear		

9.6 PERCEIVED EASE OF USE:

			0	1	2	3	4	5		NA	Comments
19.	Learning to operate the device would be easy for me	Unlikely							Likely		
20.	I would find it easy to get the device to do what I want it to do	Unlikely							Likely		
21.	My interaction with the device would be clear and understandable	Unlikely							Likely		
22.	I would find the device to be flexible to interact with	Unlikely							Likely		

23.	It would be easy for me to become skillful at using the system	Unlikely							Likely		
24.	I would find the device easy to use	Unlikely							Likely		